Small Community Wastewater System Design – Balancing Stakeholder Interests

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ASTRACT

Managing wastewater treatment in a sustainable manner, being fiscally, environmentally and socially, is a challenging issue throughout New Zealand. Land treatment has its fair share of these challenges, with a key one being balancing the interests of stakeholders.

Consultation with stakeholders in the wider community is an essential part of developing a land treatment system and may be initiated as part of a Long Term Plan (LTP) to develop a wastewater strategy for a district or as part of a resource consent application process.

There are a number of reasons that consultation at an early stage of the planning and design process is valuable, including:

- Avoiding designs and assessments based on incorrect assumptions about the desired or perceived outcomes, whether they be environmental, cost or social;
- An opportunity to utilise potentially innovative ideas that stakeholders may have; and
- The potential to proceed down a non-notified consenting path.

A series of steps within the planning and design process are proposed at which consultation with the appropriate stakeholders can occur. They are:

- Step 1 – What is the Current Situation
- Step 2 – What are the Results Required
- Step 3 – What are the Available Options
- Step 3a – Examination of Options
- Step 3b – Land Treatment Evaluation
- Step 3c – Detailed Land Treatment Investigation and Conceptual Design
- Step 4 – Preliminary System Design

By reverse engineering or backcasting from a desired end target, the method to achieve that outcome can be established. Both the desired end target and the method can benefit from the active involvement of stakeholders.

Including stakeholders in the early part of a WWTP upgrade process ensures that the wastewater generator is able to better identify a solution which balances the stakeholder views without over or under designing a system. This paper considers options to engage with stakeholders to develop technically sound land treatment solutions.

INTRODUCTION

In New Zealand, small communities have traditionally used surface water for the discharge of treated municipal wastewater. In order to protect and improve water quality in coastal

and inland waters there is pressure on communities to find alternative methods and locations for effluent discharge. Land treatment of wastewater is a relatively well accepted and understood mode of discharge, and is increasingly being adopted to replace or complement surface water discharges. However, full time land discharge is frequently not the preferred system due to a number of factors such as:

- Risk of soil and/or plant damage at high seasonal soil moisture contents;
- Increased risk of leaching to groundwater due to higher drainage volumes (high or sustained rainfall conditions);
- Prohibitive cost and land requirements for storage to withhold irrigation during wet periods; and
- Lower sensitivity in the surface water receiving environment under high flow conditions.

The design of a land treatment system must take into account the often incompatible requirements of:

- Environmental impact;
- Public health considerations;
- Capital and operational cost to the community; and
- Availability of operational knowledge and skills.

Stakeholder groups are generally represented by:

- Territorial authorities, who are also typically the generator of the wastewater;
- Ratepayers, both individual and ad hoc groups;
- Regional councils;
- Local and regional tangata whenua;
- Environment and public health organisations (e.g. Department of Conservation, district health boards); and
- Recreational and special interest groups (e.g. Fish and Game).

Each stakeholder group has different priorities and expected design requirements. In many cases their interest is on the complete withdrawal of discharges from surface water, but where that is not possible their concerns relate to the rationale and proportioning of wastewater applied to both land and water. In order to achieve the successful implementation of a land treatment scheme the competing interests of stakeholder groups must be balanced.

Managing wastewater treatment in a sustainable manner, fiscally, environmentally and socially is a challenging issue throughout New Zealand. This paper is focussed on smaller communities (500 to 4,000 people) with issues regarding their existing wastewater discharge and a predominantly rural ratepayer base.

THE TYPICAL SCENARIO

The need for small community wastewater upgrades is occurring in many places around the country. Many systems designed in the 1960s and 1970s have been ‘tinkered’ with, but are now in need of more substantial upgrades. Some commonalities have emerged in our experience with small community wastewater upgrades, being:

- Small communities, permanent population, low resourcing levels, inland, aged reticulation and treatment networks, high winter flows due to infiltration and ingress, pond discharge to surface water, challenging soils or topography in

immediate area. These systems are typically on their 2nd discharge permit application under the current regulatory framework; or
- Small communities (often, but not always coastal), with septic tank treatment which is causing a significant public health risk; and
- In all cases the environment to which the discharge is occurring is either sensitive or degraded, and an improvement on the existing environmental quality is required by Regional Council or central government.

THE PROCESS OF CONSULTATION

There are several reasons why consultation with the wider community is initiated. It may be part of a Long Term Plan (LTP) to develop a wastewater strategy for a district; or a resource consent application process.

When it comes to resource consenting stakeholder consultation has often been retrospective; interested parties are informed of the system details once the system design and an evaluation of its effects has been completed. In some cases the preferred consultation route is to submit a resource consent application and consult as directed by the consenting authority through a hearing process. Is this too late? In our view it is, as it misses a number of opportunities to engage with the stakeholders and achieve a better system and smoother consenting process. Key benefits of earlier engagement are:

- Avoiding designs and assessments based on incorrect assumptions about the desired outcomes, whether they be environmental, cost or social;
- An opportunity to utilise potentially innovative ideas that stakeholders may have;
- Removing the grounds for ratepayer unrest about a Council's hidden agendas;
- The prospect of community "ownership" of the proposal; and
- The potential to proceed down a non-notified consenting path.

STAKEHOLDER ENGAGEMENT

Stakeholders and parties with a view on a scheme upgrade can be broadly partitioned into two groups, being:

- Those that have a focus on costs and scheme engineering; and
- Those that have a focus on effects resulting from the upgraded scheme.

Typically the costs and scheme engineering group have limited concern about the effects, but are more concerned about the technology being used and the cost implications for them as a rate payer and the community at large. They often drive solutions and outcomes based around cost minimisation, or preconceived preference/biases of treatment options. This group often get involved in the early concept stage of an upgrade as the wastewater generator justifies the expenditure on a project.

The latter group has more of a focus on the effects of the proposal and a lesser concern about the costs. This group of stakeholders may also have contributed to initiating a review of the system which identified the need for a scheme upgrade.

Communication needs to be tailored to each stakeholder group to ensure that they can contribute meaningfully and so that they do not disengage from the process.

CONSULATION THROUGH THE PLANNING AND DESIGN PROCESS

A series of steps are followed in the planning and design process. The information requirements for successful consultation are different at each step. The steps leading to system design are briefly described below.

Step One - What is the Current Situation
The first step to successful stakeholder engagement is to know and be able to communicate what the current situation is. This applies to:

- The wastewater network including its performance and flaws; and
- The present state of the receiving environment.

In most cases WWTP operators are collecting wastewater flow and quality data. As consent holders they are also likely to be collecting receiving environment data (surface water, groundwater, soil) pertinent to the discharge. This information should be collated and interpreted along with relevant information from other agencies such as the regional council. The information prepared needs to be clear and concise.

Step 2 - What are the Results Required
The next critical step to assist with the decision making process is determination of what the WWTP design or upgrade needs to achieve.

A key stakeholder in the determination of what outcomes are to be achieved will be the regional council. Through the notification and hearing process associated with Regional Plan and Policy development the community's views and values regarding the environments which may receive the wastewater discharge have been interpreted and quantified. This larger regional plan process is often a reflection of the views of stakeholders that have an interest in a specific discharge and serve to provide initial generic guidance about stakeholder expectations.

The regional council may have specific policies, such as adoption of land treatment as preference. They are likely to also have objectives for environmental health, particularly regarding surface water, and aims for the improvement of certain catchments. State of the Environment Monitoring databases may have been used to develop critical limits and water quality standards on a regional or catchment scale.

From this information the preliminary goals of the scheme for environmental and some social and cultural parameters can be prepared. At this point the wider stakeholder groups can be consulted regarding the information obtained for Stages 1 and 2 and their views used to establish the relevance and accuracy of the various parameters.

The intent of consultation at this stage is to:

a) Inform stakeholders about the current system performance, state of the receiving environment and contribution that the WWTP system makes to the receiving environment;
b) Inform stakeholders about what guidelines need to be met in terms of the discharge method and discharge quality as proposed by the regional council; and
c) Seek feedback about the prioritisation of issues to be addressed.

The latter feedback loop highlights both the range of issues which stakeholders consider to be important, and the key concerns for all stakeholders. Once it is known what limits need

to be achieved, planning of a solution (discharge upgrade) can begin. This process can be known as backcasting or reverse engineering.

Step 3 – What are the Available Options

The project will always be, to a certain extent, constrained by the available resources. This refers to the funding (although this is generally set following the preliminary design stage), consideration of operation and management requirements of the system, and timing constraints.

Step 3a – Examination of Options

An examination of the options available to meet the goals set in the previous step can be undertaken. In the earlier stages the examination should focus on the modes of discharge and not the technologies stage. Often the outcomes get compromised because certain stakeholders get sidetracked on technology options.

There are a number of options available to improve the discharge quality which may include:

- Long term full time discharge to river with a WWTP upgrade;
- Land disposal (high rate discharge to result in land passage but little attenuation of wastewater components);
- Full time land treatment (at a rate maximising nutrient and pathogen assimilation in the soil);
- Combined discharges to land and water; and
- Wastewater reuse (treatment and reticulation for non-potable use such as toilet flushing or fire fighting).

No option should be discounted at this point. For each discharge option a comparative assessment can be made as to the wastewater quality required to be produced and the infrastructure required. This enables an unbiased assessment of options to be considered against individual stakeholder values.

Further consultation is not recommended at this stage; as stakeholder views obtained in the previous stage can be added as a decision making parameter in the option evaluation. For instance, the treatment quality required for discharge to river may be the same as for wastewater reuse, however there is a significant investment in additional infrastructure (pipe network and on-lot works) for the reuse option. If however, the community has a long term goal to achieve water savings then the reuse option should not be excluded. Alternatively while there may be a preference for full-time discharge to land, the feasibility of using land may not be known, so other options cannot be excluded at this early state.

Step 3b – Land Treatment Evaluation

It is at this point that an evaluation for land treatment in the area can be made. This should initially be a desktop evaluation which can be used to identify preferred areas for land treatment based on parameters such as:

- Reticulation requirements (distance and elevation);
- Property size;
- Slope and stability;
- Land use (nutrient uptake potential, acceptability of wastewater, special use locations);

- Soil attributes (drainage, permeability, depth to restrictive layer); and
- Hydrological and hydrogeological attributes (depth to seasonal high water table, mounding risk, flood return interval).

To complete the evaluation, weightings should be applied to each evaluation parameter to allow a subjective and impartial assessment of the respective options. The stakeholders should ideally be engaged at this stage to determine a consensus on the weightings of the parameters that are of greatest importance them. An effective way to balance the views of the stakeholders (which include the WWTP operator) is to aggregate the weightings. This process needs to be transparent and well communicated.

The resulting weightings for each parameter reflect the combined views of the stakeholders and provide some certainty for the WWTP operator that the solution they adopt is sufficiently focussed on the issues of most importance to stakeholders.

It is important that this assessment process is divided into two parts, being a technical feasibility and preference component, followed by an overlay that considers costs. When dealing with stakeholders it is important to ensure that costs are not presented as the initial driver for discounting options. The reality is that if options are expensive they will get discounted, but it is best to let the stakeholders arrive at that point once the technical aspects have been considered. This results in better buy in and acceptance in the longer term.

Step 3c – Detailed Land Treatment Investigation and Conceptual Design

The weighted aggregation of land application suitability parameters will provide direction as to land areas for further investigation, if land application passes the initial assessment of preferred options. Once field investigations have been undertaken the land application conceptual design can be undertaken which will determine the area needed, application regime and potentially storage requirements. From this information, an assessment of the wider options (river discharge, land disposal, land, treatment, etc) can be made with more accurate comparative costings.

Based on the information obtained from earlier stakeholder consultation and the comparative costings, the council should be able to identify the favoured two or three treatment and discharge options. These options can be presented to the stakeholders in terms of:

a) Technical feasibility;
b) Effects including improvement from the current situation; and
c) Costs and engineering requirements for the options.

Feedback sought from stakeholders at this stage can be taken into consideration in selection of the final design option.

Step 4 – Preliminary System Design

Once there is a good understanding of :

a) What the current situation is;
b) What the future goals for discharge quality are; and
c) What resources (including land) are available,

then the WWTP operator is in a good position to make the decisions regarding the technologies to be employed and to undertake the design of a system and schedule of improvements to achieve the identified goals.

CONCLUSION

This paper's key message is that early and sustained engagement of stakeholders in the development of small community wastewater systems and upgrades offers two clear benefits. The local authority responsible for the service will be seen to be operating in a politically sustainable manner, which is good for the careers of elected Councillors and chief executives alike. And there is a good prospect that the litigation, delays and costs that can be triggered by stakeholders who have not been engaged can be reduced, if not avoided altogether.

Stakeholder engagement, like scheme design, should proceed from the general to the particular in a structured order, that will provide self-evident answers to the inevitable questions about cost that will arise later. By initially focussing on the overall goals for the WWTP discharge and stakeholder interests, rather than options to achieve those goals, there is a potential that a solution that would have otherwise not have been considered may present itself as the most appropriate for the location.

An evaluation of land application suitability for the area is a useful tool to determine a likely discharge regime in the area, and may assist to clarify stakeholder issues. By including stakeholders in the process the wastewater authority is better able to identify a solution which balances the stakeholder views without over or under designing a system.